
Network traffic measurements

The NTRF feature provides traffic measurement data related to network performance and network traffic. The NTRF feature can be equipped at ESN nodes and ESN Mains. Using this data allows the network manager to assess the effectiveness of the network and to identify specific areas of network operation where improvements are needed.

The network traffic measurements accumulated at an switch equipped with the NARS (ESN node), BARS (ESN main), or CDP feature encompass the following areas of operation (in addition to regular traffic measurements):

- Network Class of Service (NCOS),
- Routing,
- Off-Hook Queuing (OHQ),
- Call-Back Queuing (CBQ),
- Coordinated Call-Back Queuing (CCBQ),
- Call-Back Queuing to Conventional Mains (CBQCM), and
- Incoming Trunk Groups.

Routing traffic measurements

A route list is a list of outgoing alternate trunk routes to a specific location from an switch.

Trunk routes in a route list are termed route list entries. The number of route lists/entries that can be defined at an switch depends on the features equipped at that switch. [Table 24](#) lists the parameters for the different features and feature combinations. The values shown in parentheses are for X11 Release 13 and greater.

Legend for Table 24:

NCOS = Network Class of Service

FCAS = Free Calling Area Screening

SDR = Supplemental Digit Restriction

Table 24
Summary of networking feature parameters

Parameter	BARS	NARS	CDP	CDP with BARS	CDP with NARS
NCOS Groups	0–99 (0–7)	0–99 (0–15)	0–99 (0–3)	0–99 (0–7)	0–99 (0–15)
Facility Restriction Levels	0–7	0–7	0–7	0–7	0–7
Digit Manipulation Tables	1–255	1–255	1–31	1–255	1–255
Route Lists	0–127	0–255	0–31 (0–127)	0–127	0–255
Route List Entries	0–31 (0–7)	0–31 (0–7)	0–6 (0–2)	0–31 (0–7)	0–31 (0–7)
FCAS Tables	1–127	1–255	–	1–127	1–255
SDR Tables	0–255	0–511	–	0–255	0–511
Steering Codes	– –	– –	1–10,000 (1–5,000)	1–10,000 (1–5,000)	1–5000

Note 1: If the NARS and BARS features are equipped in the same switch but for different customers, the highest parameter values apply to that switch; for example, if one customer has NARS and another customer has BARS, the NARS parameters apply to the BARS customer.

Note 2: If the New Flexible Code Restriction (NFCR) feature is equipped, the number of available NCOS groups is 8, see *X11 Features and Services*. With X11 Release 13 and later, this number is expanded to 100.

Note 3: NSIG provides 16 NCOS groups.

Note 4: Parameters in parenthesis are for releases prior to X11 Release 13.

The TFN001 routing measurements provide data related to route list utilization. The measurements show how often a route list was accessed, which entries in the list were used, and whether the call was successful in completing a selection or connection. Routing traffic measurements are available at ESN node and ESN main switches.

The routing traffic measurements contain the following statistics for each defined route list.

- **Route list requests** This measurement identifies the total number of call attempts for which the called destination translations identified this route list to attempt call completion.
- **Route list requests served without delay** This measurement reflects the total number of network calls which were routed without encountering blocking or queuing.
- **Expensive route acceptances** This measurement identifies the number of calls which were allowed to complete over an expensive trunk route after the Expensive Route Warning Tone (ERWT) was given.
- **Route list requests standard blocking** This measurement identifies the number of call attempts which could not be served because a route or queuing process was not available to a user. The blocked call may have been routed to overflow tone, a recorded announcement, or the attendant.
- **Route list entry usage count** This measurement identifies the number of calls which were routed successfully over a particular route (entry) in a route list. A count is maintained for each route list entry.

OHQ measurements

Traffic measurements for Off-Hook Queuing (OHQ) are associated with each route list and identify the utilization of the OHQ feature. The OHQ measurements are included with the routing traffic measurements (TFN001), and contain the following statistics for each route list.

- **Quantity of calls placed in OHQ** This measurement identifies the number of calls which attempted to use a route in the route list. But because facilities were not immediately available, the call was permitted to remain off-hook to wait for facilities.
- **Average time in OHQ** This measurement identifies the average duration that calls remained in the OHQ until a route became available. The value (expressed in units of 0.1 second) represents the average time in the queue. Calls which timed out in the queue before a route was selected are also included in the average.
- **Quantity of calls abandoned from OHQ** This measurement identifies the number of calls which were placed in the OHQ but were abandoned. For example, the caller went on-hook before a route became available or the time limit was reached.

CBQ measurements

Traffic measurements for CBQ are associated with each route list and identify the utilization of the feature. The CBQ measurements are included with the routing traffic measurements (TFN001) and contain the following statistics (for each route list).

- **Quantity of CBQ calls** This measurement identifies the number of calls which were offered CBQ and accepted the offer.
- **Average time in CBQ** This measurement identifies the average duration (in units of 0.1 second) calls remained in the CBQ. Calls which were cancelled and calls which were served are included in this measurement.
- **Quantity of CBQ offerings** This measurement is a count of the number of calls which were offered CBQ, regardless if the offer was accepted or not.
- **Quantity of CBQ user cancellations** This measurement identifies the number of calls which were removed from the CBQ on the call originator's request. For example, cancellation of the Ring Again feature.
- **Routing traffic report output format** The routing traffic measurements are output for each route list as shown in [Table 25](#).

Table 25
TFN001 routing format

System ID		TFN001							
Customer number									
RLST	xxx	route list requests	route list requests served without delay	expensive route acceptance	route list requests standard blocking	not defined	not defined		
	RT		route list entry use	route list entry use	route list entry use	route list entry use	route list entry use	route list entry use	route list entry use
			SL1TD calls	SL1TD calls	SL1TD calls	SL1TD calls	SL1TD calls	SL1TD calls	
	OHQ	OHQ calls	time in OHQ	abandoned calls					
	CBQ	CBQ calls	average time in CBQ	CBQ offerings		CBQ user cancel			
Example									
0434		TFN001							
000									
RLST	000	00345	00344	00012	00000	00000	00000		
	RT		00000	00000	00000	00000	00000	00000	00000
			00000	00000	00000	00000	00000	00000	00000
			00000	00000	00000	00000	00000	00000	00000
			00000	00000	00000	00000	00000	00000	00000
			00000	00000	00000	00000	00000	00000	00000
			00000	00000	00000	00000	00000	00000	00000
			00000	00000	00000	00000	00000	00000	00000
			00000	00000	00000	00000	00000	00000	00000
	OHQ	00000	00000	00000					
	CBQ	00000	00000	00000	00000				
Note 1: OHQ and/or CBQ information is printed only if the feature is equipped and activated.									
Note 2: The two fields not defined always show zeroes (0).									

NCOS measurements

The TFN002 NCOS measurements are shown in [Table 26](#).

Traffic measurements are collected for each defined NCOS group to indicate the grade of service, in terms of blocking and queuing delay, being provided by the system. If a grade of service is determined by the communications manager to be inappropriate for users in a particular NCOS group, then the communications manager can either reassign the users to another NCOS group, redefine the characteristics of the existing NCOS group, or change the routing parameters. NCOS measurements are available at ESN node and ESN main switches.

The TFN002 NCOS measurements contain the following statistics for each defined NCOS group:

- **Quantity of calls attempted** This measurement identifies the total number of call attempts generated by users in an NCOS group.
- **Routing requests served without delay** This measurement identifies the number of call attempts which were routed without encountering blocking or queuing.
- **Expensive route acceptance** This is a count of the number of callers who accepted an expensive route to complete a call.
- **Network Call Standard Blocking** This measurement identifies the number of call attempts which could not be completed because a route or queuing process was not available to a user. The blocked call may have been routed to overflow tone, a recorded announcement, or the attendant.
- **Quantity of calls refusing expensive routes** This measurement identifies the number of calls which were given ERWT and elected not to use the expensive route.
- **Quantity of calls placed in OHQ** This measurement identifies the number of calls that were placed in the OHQ.
- **Average time in OHQ** This measurement identifies the average duration that calls remained in the OHQ until a route became available. The value (in units of 0.1 second) represents the average time that calls were in the queue. Calls which timed out in the queue before a route was selected are also included in the average.

- **Quantity of CBQ calls** This measurement identifies the number of calls which were offered CBQ and accepted the offer.
- **Average time in CBQ** This measurement identifies the average time that calls waited in the CBQ for a route to become available. It includes calls which requested a cancellation, calls which were served, and direct Ring Again against trunks. The average time is expressed in units of 0.1 second.

Table 26
TFN002 NCOS report

Format							
System ID	TFN002						
Customer number							
NCOS	network class of service group	calls attempted	routing requests served without delay	expensive route acceptances	network call standard blocking	not defined	calls refusing expensive routes
	OHQ	OHQ calls	average time in OHQ				
	CBQ	CBQ calls	average time in CBQ				
Example							
0423	TFN002						
000							
NCOS	000	00207	00197	00000	00001	00000	00000
	OHQ	00007	00237				
	CBQ	00000	00000				
Note 1: OHQ and/or CBQ information is printed only if feature is equipped and activated.							
Note 2: Note 2: The field that is not defined always shows all zeroes (0).							

Incoming trunk group measurements

The incoming trunk group measurements (TFN003) are output as shown in [Table 27](#).

The TFN003 Incoming Trunk Group Measurements provide an indication of the incremental traffic that was imposed on incoming trunk groups by the network queuing features. Data are provided for each incoming or two-way trunk group that is offered OHQ, CCBQ, or CBQCM. These measurements are available at ESN nodes.

The following measurements are accumulated for each incoming (or two-way) trunk group:

- **Quantity of calls placed in OHQ** This measurement identifies the number of incoming trunk calls that were placed in the OHQ for possible connection to another trunk group.
- **Average time in OHQ** This measurement reflects the average time (in units of 0.1 second) that calls waited in the OHQ for a trunk to become available. The average time includes those calls that were removed from the OHQ by caller abandonment, or were removed from the queue after expiration of the OHQ time limit.
- **Quantity of incoming calls offered CCBQ or CBQCM** This measurement identifies the number of incoming trunk calls that were blocked at the ESN node, and the user was given the option of accepting an ESN node initiated callback when facilities become available. The measurement relates to use of the CBQ feature by users at an ESN main (Coordinated Call-Back Queuing) or Conventional main (Call-Back Queuing to Conventional Mains).
- **Quantity of calls accepting CCBQ or CBQCM** This measurement identifies the number of incoming trunk calls that were blocked at the ESN node, were offered CBQ, and accepted the offer. The count relates to CBQ acceptances by users at an ESN main or Conventional main.
- **Average time in CBQ** This measurement (expressed in units of 0.1 second) reflects the average time that users at an ESN main or Conventional main remained in the CBQ (at the ESN node) for a facility to become available.

Note 1: When a CCBQ callback is offered to a busy station at an ESN main, the call is removed from the queue for 5 minutes, then reinserted in the queue. This process occurs only once. The additional queuing time is added to the average time. The 5-minute suspension time is not included in the average time, nor is it reinsertion into the queue pegged as another CBQ call.

Note 2: When a CBQCM callback is offered to a station at a Conventional main that is busy or fails to answer the callback, the call is removed from the queue and reinserted into the queue as specified in Note 1.

- **Quantity of calls blocked in callback** This measurement identifies the number of CBQ callbacks (CCBQ or CBQCM) initiated by the ESN node that could not be completed because an outgoing trunk group (to the ESN main or Conventional main) was not available.
- **Callback Attempts No Answer and cancellation** This measurement identifies the number of callback attempts that were not successful because the caller failed to answer the callback. CBQ callbacks to a station at an ESN main that has previously cancelled CBQ are treated as Callback Attempts No Answer.

Table 27
TFN003 Incoming Trunk Group

Format						
System ID		TFN003				
Customer number						
TRKG	incoming trunk group					
	OHQ	calls placed in OHQ	average time in OHQ			
	CBQ	incoming calls offered CBQ, CCBQ, CBQCM	calls accepting CBQ, CCBQ, CBQCM	average time in CBQ, CCBQ, CBQCM	blocked CBQ, CCBQ, CBQCM callbacks	callback attempts not answered or cancelled
Example						
0423	TFN003					
000						
TRKG	003					
	OHG	00006	00263			
	CBQ	00000	00000	00000	00000	00000

OHQ threshold violation measurement

The output format for this threshold measurement is shown in [Table 28](#).

The OHQ overflow threshold measurement (TFN101) provides an indication that more than the expected number of users are timing out in the OHQ. This means that OHQ is offered and accepted, but a trunk does not become available before the service-changeable OHQ time limit expires. This could result from trunks being out of service, an incorrectly defined OHQ time limit, or temporary traffic overload.

Table 28
OHQ threshold violation measurement

Format		
System ID		TFN101
Customer number		
OHQT	timed out OHQ calls	threshold
Example		
0423TFN101		
000		
OHQT	00333	00000

Traffic measurement options

New traffic measurement options are introduced with the NTRF feature.

These options are set and/or queried through use of the Traffic Control program (LD 2) in the normal manner. For more information, see *Traffic measurement formats and output* (553-2001-450). The options are:

- to generate Routing Measurements (TFN001)
- to generate NCOS Measurements (TFN002)
- to generate Incoming Trunk Group Measurements (TFN003)